

Rolling bearing in aircraftField of the invention

The invention relates to a rolling bearing which is used in aircraft, in particular helicopters.

In aircraft, there are particular demands with regard to lightweight construction. For this reason, the rolling bearings which are used in these aircraft also have to satisfy the demands relating to lightweight construction. Given the constantly increasing demands on the performance of the rolling bearings, the problem has arisen that consequently conventional, fully hardening rolling bearing steels can no longer be used, on account of the possibility of cracks occurring under high loads.

DE 8711624 U shows a rolling bearing for aeronautical applications which satisfies the requirements for a lightweight construction yet is in a form which is very difficult to produce. Despite the complex form of this rolling bearing or of the rolling bearing raceways, the demands imposed with regard to the possibility of the formation of cracks being minimized are not satisfied by this embodiment.

Object of the invention

Therefore, the object is to propose a process for thin-walled rolling bearing raceways in aeronautical

applications in which the risk of cracking is reduced.

#### Description of the invention

According to the invention, the object is achieved by the features given in the characterizing clause of claim 1.

The core concept of the invention consists in the raceways of the rolling bearing being surface-hardened. This surface-hardening makes it possible to considerably reduce the risk of cracking even when using thin-walled materials. The lower core hardness of the raceways prevents any cracks which may form originating in the running surfaces or in the rolling contact from propagating further.

Particularly positive properties are produced for the rings according to the invention if they have a surface hardness in the region of the raceways of  $> 613 \text{ HV}$  (56 HRC) and a core hardness in the thin-walled rings of  $> 285 \text{ HV}$  (28 HRC). The core hardness is reached at a depth of between 8% of the rolling body diameter and 90% of the wall thickness of the race in the race base.

In this context, raceways are described as thin-walled if the ratio of the pitch circle diameter ( $T_k$ ) to the rolling body diameter ( $D_w$ ) is greater than or equal to 20 ( $T_k/D_w \geq 20$ ).

Brief description of the figures

Figure 1 shows a single-row groove ball bearing in section;

Figure 2 shows a two-row angular ball bearing in section.

Detailed description of the drawings

Figure 1 shows a single-row groove ball bearing 1. The outer ring 3, the inner ring 4 and the rolling bearings 6 are illustrated. The region with the surface hardness 7 of  $\geq 613$  HV is indicated in the drawing around the region of the race. The region having the core hardness 8 adjoins the region having the surface hardness 7. The location of the pitch circle diameter  $T_k$  and the rolling body diameter  $D_w$  are shown in the drawing. The pitch circle diameter  $T_k$  is based on the center point of two opposite balls.

Figure 2 illustrates a two-row rolling bearing in the form of a two-row angular ball bearing. The common outer ring 5 comprises two races in which the balls 6 roll. This two-row angular ball bearing 2 has two inner rings 4. The position of the pitch circle diameter  $T_k$  and of the rolling body diameter  $D_w$  are indicated similarly to in Figure 1. The region having the surface hardness of  $\geq 613$  HV is illustrated in the region of the race and of the inner ring 4 and also of the outer ring 5. The contiguous region having the surface hardness made up of two adjacent races 7a is illustrated. In components having two races,

there is also the possibility of the region having the surface hardness 7 being positioned separately around the races.

List of designations

- 1 Single-row rolling bearing, groove ball bearing
- 2 Two-row rolling bearing, angular ball bearing
- 3 Outer ring
- 4 Inner ring
- 5 Outer ring, two-row
- 6 Rolling body
- 7 Region having the surface hardness at the race
- 7a Region having the surface hardness for two races
- 8 Region having core hardness
- $T_k$  Pitch circle diameter
- $D_w$  Rolling body diameter